PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SPARR001	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/AU2004/000998	International filing date *(day/month/year)* 26 July 2004	Priority date *(day/month/year)* 24 July 2003

International Patent Classification (IPC) or national classification and IPC

Int. Cl.[7] E21B 4/14, 10/60, 21/00

Applicant

SPARROC DRILLCO SERVICES PTY LTD et al

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. [X] *(sent to the applicant and to the International Bureau)* a total of 4 sheets, as follows:
      - [X] sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      - [ ] sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. [ ] *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:

[X]	Box No. I	Basis of the report
[ ]	Box No. II	Priority
[ ]	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
[ ]	Box No. IV	Lack of unity of invention
[X]	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
[ ]	Box No. VI	Certain documents cited
[ ]	Box No. VII	Certain defects in the international application
[ ]	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of the report
22 February 2005	15 June 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer S. GHOSH Telephone No. (02) 6283 2163

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/AU2004/000998

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1 (b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

☐ the international application as originally filed/furnished

☒ the description:

pages **1-11** as originally filed/furnished
pages* received by this Authority on with the letter of
pages* received by this Authority on with the letter of

☒ the claims:

pages as originally filed/furnished
pages* **16-19** as amended (together with any statement) under Article 19
pages* received by this Authority on with the letter of
pages* received by this Authority on with the letter of

☒ the drawings:

pages **1/11 – 11/11** as originally filed/furnished
pages* received by this Authority on with the letter of
pages* received by this Authority on with the letter of

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☒ The amendments have resulted in the cancellation of:

☐ the description, pages
☒ the claims pages 12 - 15
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages
☐ the claims, Nos.
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/AU2004/000998

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-15	YES
	Claims		NO
Inventive step (IS)	Claims	1-15	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-15	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The documents identified in the International Search Report have been considered for the purposes of this report.

Novelty (N) Claims 1-15

None of the documents cited in the International Search Report disclose all of the features of each of the independent claims.

Therefore the subject matter of these claims is new and meets the requirements of Article 33(2) of the PCT with regard to novelty.

Inventive Step (IS) Claims 1-15

The claimed invention is not obvious in the light of any of the cited documents nor is it disclosed in any obvious combination of them. It is also considered that it would not be obvious to a person skilled in the art in the light of common general knowledge either by itself or in combination with any of these documents.

Therefore the subject matter of these claims is not obvious and meets the requirements of Article 33(3) of the PCT with regard to inventive step.

Industrial Applicability (IA)

The invention defined in the claims is considered to meet the requirements of Industrial Applicability under Article 33(4) of the PCT because it can be made by, or used in, industry.

AMENDED CLAIMS

[received by the International Bureau on 05 October 2004 (05.10.04);
original claims 1, 8, 10-13 amended; remaining claims unchanged (4 pages)]

1. A downhole hammer drill including:

a drive sub or chuck mounted on an air hammer casing;

and

a reverse circulation drill bit having a bit shank mounted in splined relation to said drive sub or chuck and a bit head adapted to extend below said chuck, an air hammer motor exhausting down the splines, an annular groove in said bit shank adjacent said bit head and extending to intersect the lower end of the bit shank splines, a sleeve secured to said bit shank over the lower end of said bit shank splines and substantially closing over said groove to form a manifold for exhaust air exiting said splines, an upper air passage directing sample accelerating air from said manifold up a sample recovery bore of said bit , said bit head having at least one lower air passage therethrough and intersecting said manifold, said lower air passage having a lower end directing air to a cutting face of the bit through an outlet through the side of the bit head adjacent a gauge row thereof communicating with a channel passing from said outlet to said cutting face.

2. A downhole hammer drill according to claim 1, wherein said splines are milled in the bit shank, the milling tool advancing the spline toward the bit head and stopping short of the bit head to avoid the milling tool from removing bit head material.

3. A downhole hammer drill according to claim 1 or claim 2, wherein said groove is formed by milling or turning, said groove forming a progressive change of section between the splined portion of the bit shank and the bit head to avoid stress concentration.

4. A downhole hammer drill according to any one of claims 1 to 3, wherein said sleeve has a section that substantially parallels the bottom surface of the groove to provide that said manifold is of substantially rectangular cross section.

5. A downhole hammer drill according to any one of claims 1 to 4, wherein said sleeve is adapted to cyclically open a port in a sidewall of said chuck to allow exhaust air to escape up the outside of the drill string to clear fines from the borehole.

6. A downhole hammer drill according to any one of claims 1 to 5, wherein said at least one lower air passage defined between the sample recovery bore and the side of the bit head adjacent the gauge row comprises one air passage for each carbide in the gauge row, the material of the bit head being relieved between the portions supporting the gauge row buttons to form the grooves, allowing the flushing air to pass to the face of the bit, entraining sample for recovery.

7. A downhole hammer drill according to any one of claims 1 to 6, wherein said lower air passage is formed by straight drilling at an angle to the drill bit axis from the side of the bit head adjacent the gauge row and extending to the sample recovery bore above the bit head, whereby a single drilling provides both the lower air passage and the upper air passage.

8. A downhole hammer drill including:

a drive sub or chuck mounted on an air hammer drill casing; and

a reverse circulation drill bit having a bit shank mounted in splined relation to said drive sub or chuck and a bit head adapted to extend below said chuck, the air hammer motor exhausting down the splines, a plurality of upper air passages each opening from a spline in the region of the bit head and each inclined toward the axis of the bit away from said bit head, said air passages directing sample accelerating air from said openings up the sample recovery bore of said bit.

9. A downhole hammer drill according to claim 8, wherein spline-borne exhaust air is also directed through the bit head by at least one lower air passage therethrough and intersecting the splines.

10. A downhole hammer drill according to claim 9, wherein said at least one lower air passage has a lower end directing air to the cutting face of the bit through an outlet through the side of the bit head adjacent the gauge row thereof and communicating with a channel passing from the outlet to the cutting face.

11. A downhole hammer drill according to claim 10, wherein said at least one lower air passage is formed as a continuation of the drilling of each of the upper air passages.

12. A downhole hammer drill according to claim 11, wherein each said upper air passage and lower air passage are co-formed by a drilling from the gauge row at the location of the button, through the bit head and into the shank, to intersect the sample recovery bore.

13. A downhole hammer drill according to claim 8, wherein each said upper air passage is formed by a drilling from the position of a gauge row at the location of a carbide button, through the bit head and into the shank, to intersect the sample recovery bore, and wherein said drilling is counter bored at its lower end to form the carbide button mounting socket.

14. A downhole hammer drill according to any one of the preceding claims, wherein there is provided a dynamic air seal to the borehole.

15. A downhole hammer drill including:

a drive sub or chuck mounted on an air hammer drill casing;

and

a reverse circulation drill bit having a bit shank mounted in splined relation to said drive sub or chuck and a bit head adapted to extend below said chuck, the air hammer motor exhausting down the splines, an exhaust air passage formed in said bit shank adjacent said bit head and adapted to receive

air exhausted at the lower end of the bit shank splines, an upper air passage intersecting said exhaust air passage and directing sample accelerating air from said exhaust air passage up the sample recovery bore of said bit , said bit head having at least one lower air passage therethrough and intersecting said exhaust air passage, said lower air passage having a lower end directing air to the cutting face of the bit through an outlet through the side of the bit head adjacent the gauge row thereof communicating with a channel passing from said outlet to said cutting face.